III) Project Year 1995

he was initialized during arch 1995 with field wor and limited burning scheduled to begin during 1995. f significant conse uence was that the project began following a winter spring 199 95 of much greater than average snow accumulation in the Sierra evada. his resulted in the most delayed snow melt in many years many upper elevation areas were not snow free and accessible until late uly or early ugust . his was followed by the driest fall in years of record with significant winter rains only beginning on December 1 . hese weather conditions resulted in delays in initiating some field components of the research and monitoring but allowed field wor to continue to a much later date in the autumn than is normally the case.

ield wor during 1995 concentrated on the south facing slope of the ast or watershed **Fig. 4** since this was the area designated as the primary burn segments for burn operations during 1995 and 199 by the ire anagement ffice. his area which includes the riole a e drainage was divided into eight segments based on topographic and anthropogenic features **Fig. 1** . Segment was selected to be the primary burn unit since it could be used to create an anchor point to tie additional burns units into. ventually a burn buffer between the lower ast or drainage and the Silver ity ineral ing developed areas would be created. hile specific plans varied during the summer by early fall the plan was to burn this segment during 199 with most line preparation completed during 1995. owever beginning on ctober 1 with blac lining ignitions during preparation of the upper perimeter the burn une pectedly bac ed downhill into the segment interior **Fig. 5** . his was due to e tremely dry conditions and the development of a strong nightly mid elevation temperature inversion. t this time a decision was made to allow the segment to continue to burn since it remained in prescription and the probability of a season ending precipitation event was high. small number of additional interior ignitions were made on ctober 9 on the ridge to the west of amp onifer southeast flan of the anuary 199 burn . he segment continued to burn with perimeter line holding until December 1 1 when 5. cm .1 in of rain fell. he total acreage treated within segment boundaries was about 5 ha 1 acres with the actual acreage physically burned within the unit slightly less due to unburned patches.

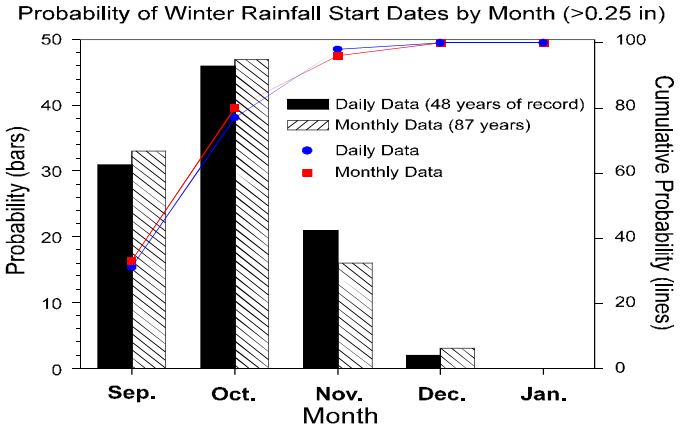

Figure 3. robability of winter season rainfall starting each year by month. Data based on sh ountain station missing values estimated from surrounding stations .

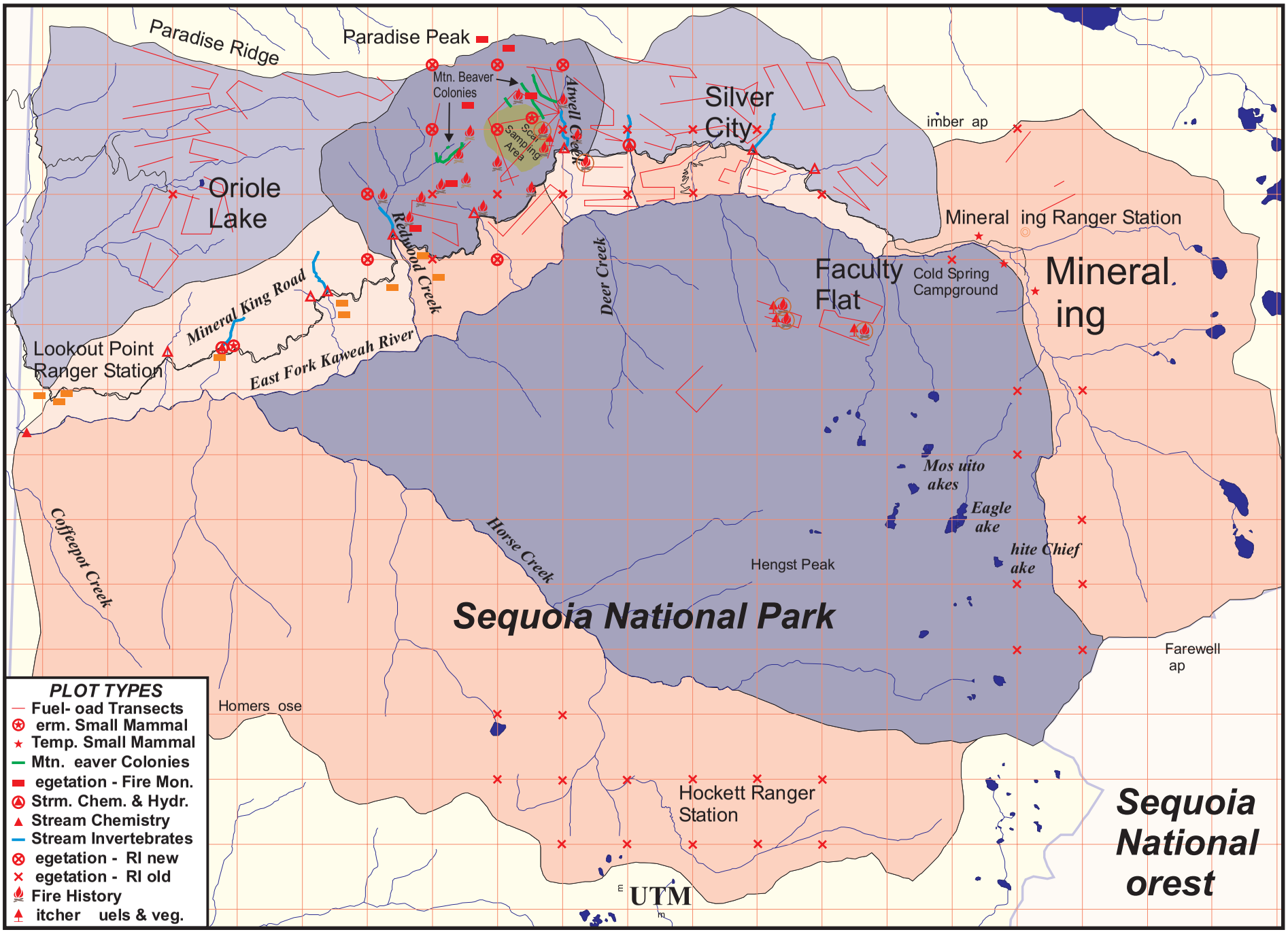

Figure 4.

Mineral King Risk Reduction Project

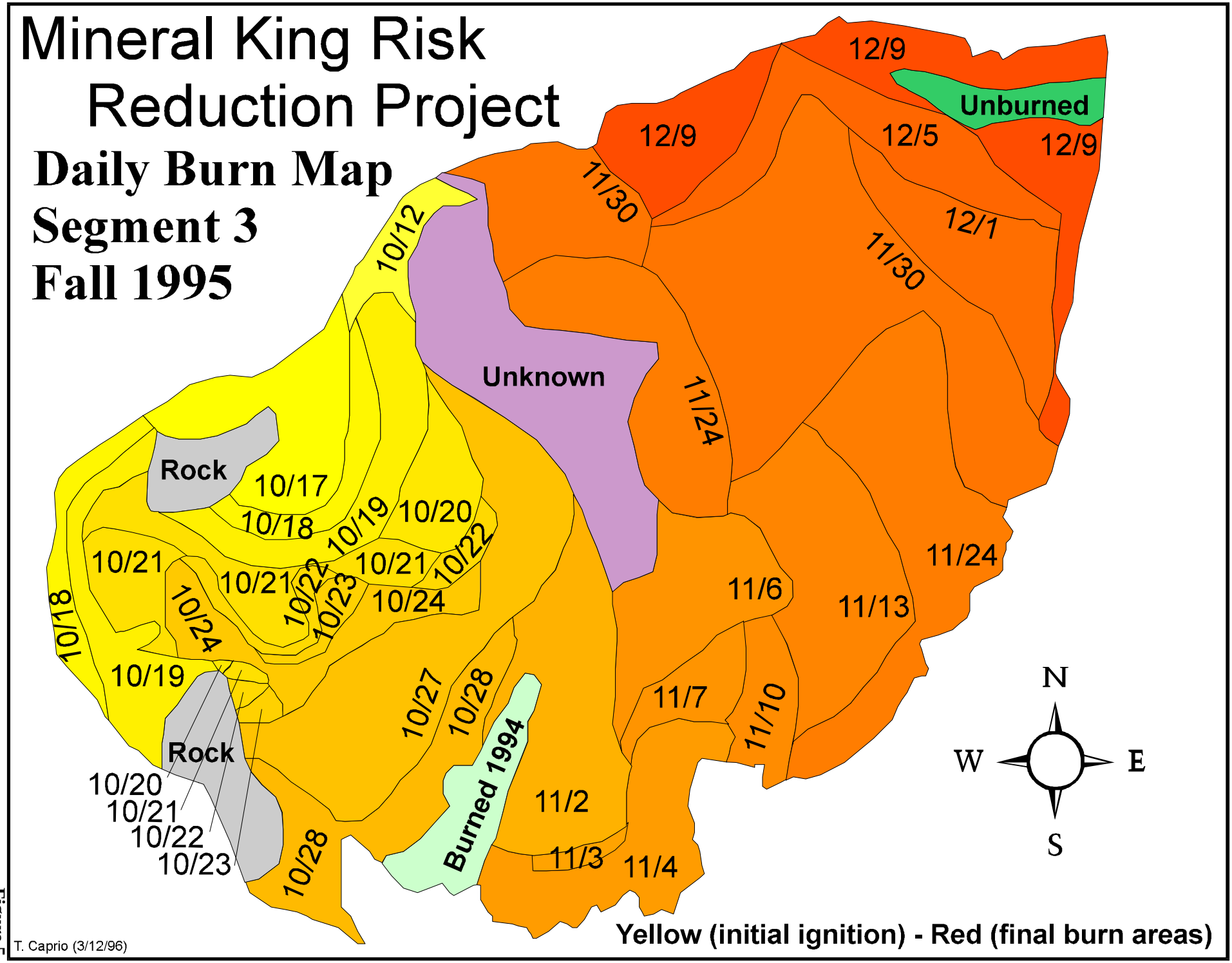
Mineral King Risk Reduction Project
Daily Burn Map
Segment 3
Fall 1995
12/9
Unburned
12/9
12/5
12/9
11/30
12/1
11/30
10/12
Unknown
11/24
Rock
10/17
10/18
10/19
10/20
10/21
10/21
10/22
10/21
10/22
10/23
10/24
10/24
10/18
10/19
11/24
11/6
11/13
10/27
10/28
11/7
11/10
Burned 1994
Rock
10/20
10/21
10/22
10/23
10/28
11/2
11/3
11/4
N
W
E
S
Yellow (initial ignition) - Red (final burn areas)
T. Caprio (3/12/96)

Figure 5.

Vegetation Sampling

1) Fire Effects Plots

Science and atural esources anagement S

ead . eifer field crew supervisor . Dempsey field crew members . verett . ndindolia . us and . hitmarsh

Objectives he fire effects plots are part of an ongoing monitoring process to assess burn objectives and achievements and to evaluate management objectives. egetation monitoring in the ineral ing burn is critical to 1 e amine changes in vegetation structure and composition detect any une pected or undesirable changes in vegetation that may be a result of the project and provide the above information to fire managers other par staff and the public. he primary monitoring variable is total fuel load since fuel reduction is currently the primary S burn objective. secondary monitoring variable has been chosen as overstory tree density although this is not a stated S burn objective.

Figure 6. Sampling densely vegetated chaparral shrub plot below the twell rove.

Field Work wo seasonal positions were funded to handle fire effects monitoring and increased wor load associated with the during 1995. ield crews set up a total of 15 plots within the si forest plots and nine brush plots. ive of the fire effects plots were located in the forested portion of segment **Fig. 7** . hese included two in giant se uoia mi ed conifer forest two in red fir forest and one in pine white fir mi ed conifer forest. red fir control plot was also set up on the immediate north side of aradise idge adjacent to segment . n addition to the forest plots three plots were established during the fall of 1995 in chemise chaparral and si plots in mi ed chaparral all in segments and **Fig. 7** .

Data Collection ith some modifications these plots followed standardized methods used for monitoring fire effects on vegetation as outlined in the S estern egion ire onitoring andboo 199 . Data collected on the plots emphasize forest structure trees and shrubs. he three red fir plots represent a new vegetation type for S s fire effects monitoring program.

he burning of segment during the fall of 1995 burned at least three of the fire effects plots within the unit and probably all five to be verified after snow melt . hree of the plots have been visited postburn and two of these have had postburn rechec s completed. either time nor personnel allowed the remaining three plots to be sampled prior to the onset of winter snows.

Plans for 1996 Field Season ostburn rechec s of plots burned during 1995 will be completed once winter snows have melted and field crews are available. ew plots will be installed in areas of the where specific vegetation types have previously been unsampled or have been under represented in

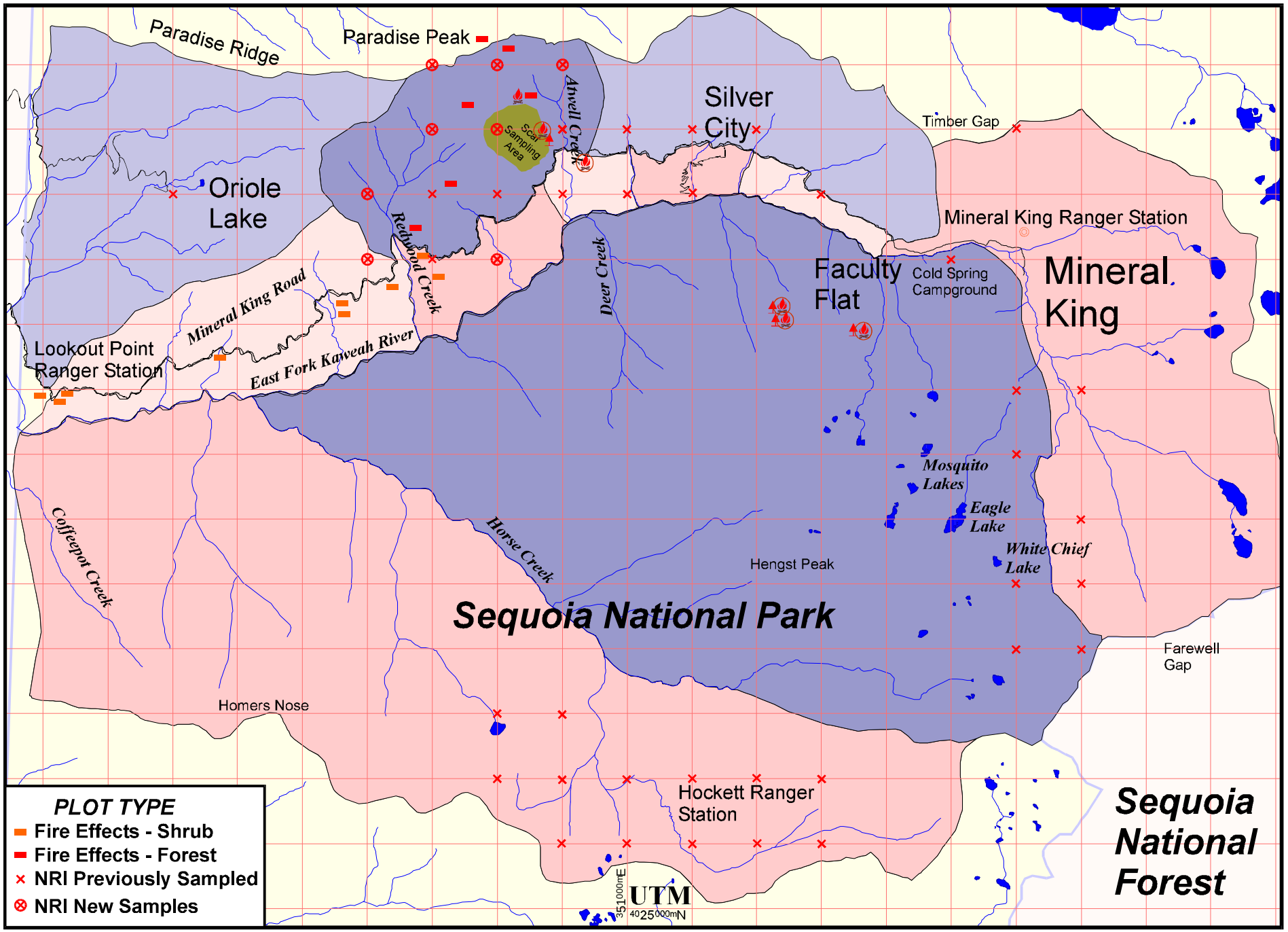

Figure 7.

Mineral King Risk Reduction Project

Vegetation Sampling

NRI Plots, Fire Effects Plots, and Sequoia Fire Scar Study

past sampling. ny brush plots burned during the winter of 199 will be rechec ed.

2) Giant Sequoia Fire Scars and Fuel Loading

Science and atural esources anagement S

ead . eifer field crew supervisor . Dempsey field crew members . verett . ndindolia . us and . hitmarsh

Objectives his study was planned to assess the relationship between the amount of fuel accumulation surrounding giant se uoias prior to burning and the resulting fire effects eifer 1995 see ppendi 1 . he specific objectives of the study are to 1 determine the amount of heavy fuels surrounding giant se uoia trees prior to and following prescribed burning and measure the specific fire effects characteristics from these measurements determine the relationship between the amount of large fuel and duff surrounding giant se uoia trees and resulting changes in fire effects characteristics bar char crown scorch fire scars and mortality provide S s ire anagement staff with the study results to assist in ma ing decisions regarding heavy fuel clearance in giant se uoia groves.

s a result of public concern about the visual effects of fire giant se uoia trees located in restoration burn units are subject to prefire fuel removal as re uired by ppendi of the S ire anagement lan . he appendi states that unnaturally high fuel levels around se uoia trees must be removed prior burning to limit bar char and crown scorch in trees greater than four feet in diameter. his study will provide information to managers about the actual impacts of burning these unnatural fuels are on se uoias. waiver of ppendi re uirements was obtained for this research project.

Figure 8. Sampling a giant se uoia for the fire scar study.

Field Work and Data Collection

he study is being conducted in the central portion of twell rove **Fig. 7** where giant se uoia trees have been selected for sampling within segment . hese trees include previously scarred individuals and unscarred trees all greater than four feet in diameter. rees were sampled during the late summer and fall of 1995. Data collected at each tree included within a . m 5 ft radius map and tally of 1 hr fuels litter and duff depths depth and width of all fire scars using permanently mar ed points bar char characteristics crown scorch height and crown scorch percent a detailed study description is given in **Appendix 1** .

During late ovember the portion of twell rove containing the sampled trees was burned by the prescribed management fire ignited on ctober 1 . ield crews were on hand during the burning of some areas where selected trees were sampled and able to ma e fire behavior observations. urning conditions they observed appeared to be of the e pected intensity and within the planned burn prescription..

Problems & Solutions Sampling of the trees in this study were originally scheduled to be completed early in the summer of 199 prior to the planned burning of the segment during that year. owever the une pected burning of the segment during the fall of 1995 re uired that an e ceptional effort be made to complete the sampling prior to the study area burning. ield crews wor ed long hours and received additional help from staff of esource anagement and the ational iological Service.

here was concern that burning of the study trees late in the year during a period when precipitation is li ely could produce non uniform burning conditions and fuel consumption over the study area and result in poor data. owever the period when the study area burned was dry and fuel consumption appeared to have been relatively uniform.

Plans for 1996 Field Season ll trees will be resampled at the earliest date possible following the melting of winter snows in the twell rove area.

3) Natural Resource Inventory Plots (NRI) ational iological Service S ield Station

D. . raber . . S. . aultain and . Sanderson

Objectives he plots were established in order to document the preburn floristic composition and forest structure of the twell rove segment aultain 199 . n effort was made to include points falling within the little nown dense chaparral adjoining the twell unit scheduled for subse uent late fall 1995 spring 199 ignition. Surveys for sensitive vascular plant species suspected to occur in the area ***Ribes tularensis*** ***Angelica callil*** were also conducted during the course of accessing the plots.

he general purpose of the plots is to provide a systematic plot based inventory for detecting and describing the distribution of vascular plants vertebrate animals and soils throughout the ar s raber et al. 199 . he inventory was initiated in 19 5 with over plots sampled by 1995. he sampling scheme is designed to be compatible with the ar s geographic information system S and to assist in the field validation of remote sensing. ll new plots within the were permanently mar ed. Data recorded include cover for all plant species present in a plot tree D vegetation type fuels soils litter duff depth roc type and evidence of fire or other disturbance.

Fieldwork ieldwor during 1995 was conducted during a wee period in uly in order to capture herbaceous species during the pea flowering period. he field crew consisted of the plant ecologist Sylvia aultain and one biological technician ric Sanderson . Due to the remoteness of many of the plots the steepness of the drainage and the dense forest chaparral cover they were able to only establish one plot per field day. Sampling within stands of ***Arctostaphylos mewukka*** south and west of the twell rove was e ceptionally slow and tortuous.

Data Collected/preliminary Results he eight plots surveyed during 1995 were established according to the standard protocol raber et al.199 using the 1 m niversal ransverse ercator grid intersections as plot locations **Fig. 7** . his allowed inclusion of plots previously established within the proposed burn area as part of the preburn sample resulting in a total of nine plots within segment and 1 plots within the ast or watershed as a whole. 1995 mar ed the first year that plots were located using a global positioning device increasing the li elihood of relocation for post burn

measurements.

etween plot surveys resulted in the discovery of one previously unrecorded population of ***Angelica callii*** south of the ineral ing roadbed. he plants are scattered along a cree margin beneath the mi ed conifer overstory in otherwise unremar able habitat. revious surveys located this species along similar cree s in the drainage and it is li ely that additional populations will be found further up the canyon along the streams between the roadbed and the ast or of the aweah. o occurrences of ***Ribes tularensis*** were noted.

f natural history interest was the occurrence of a single individual of ***Eburophyton austinae*** an achlorophyllous orchid in e tremely thic litter on plot 1. lthough this species holds no special status it is rarely encountered in Se uoia and ings anyon ational ar s and mar ed the first observation of the ta a for the field crew.

lot data and voucher specimens were curated by the staff at sh ountain under the supervision of the esearch iologist Station Director.

Future Plans for NRI Involvement: 1996 Field Season e anticipate having a field crew of two biological technicians available to re read the plots burned during fall of 1995 and to establish additional plots in segments and 5 according to protocol. ieldwor in the ast or drainage will be conducted in addition to continuing surveys throughout the ar s with perhaps four wee s of fieldwor dedicated to the . Sampling will li ely begin in ay when phenology is at pea for the chaparral plots and continue intermittently during uly and ugust according to phenology in the mi ed conifer and upper montane forests scheduled for ignition in 199 9 .

Wildlife Monitoring Science and atural esources anagement S

ead . erner field crew members . art and . ay

Objectives ildlife monitoring efforts were initiated to evaluate fire effects from the on selected mammal fauna. rimary effort was placed on small mammals because rodent populations respond readily to changes in vegetation structure and composition due to fire they are easy to handle and are a cost effective tool for monitoring fire effects erner 199 see **Appendix 2** . Small mammal populations were sampled using two methods 1 long term monitoring of permanently mar ed areas and serendipity surveys of interesting and uni ue habitats. ong term monitoring was designed to document changes in small mammal populations following fire under nown specific conditions. Serendipity trapping was conducted to inventory species and their relative abundances as a means to ma e a large scale assessment of fire effects.

Long-Term Plots During the summer and fall of 1995 two permanent long term monitoring plots

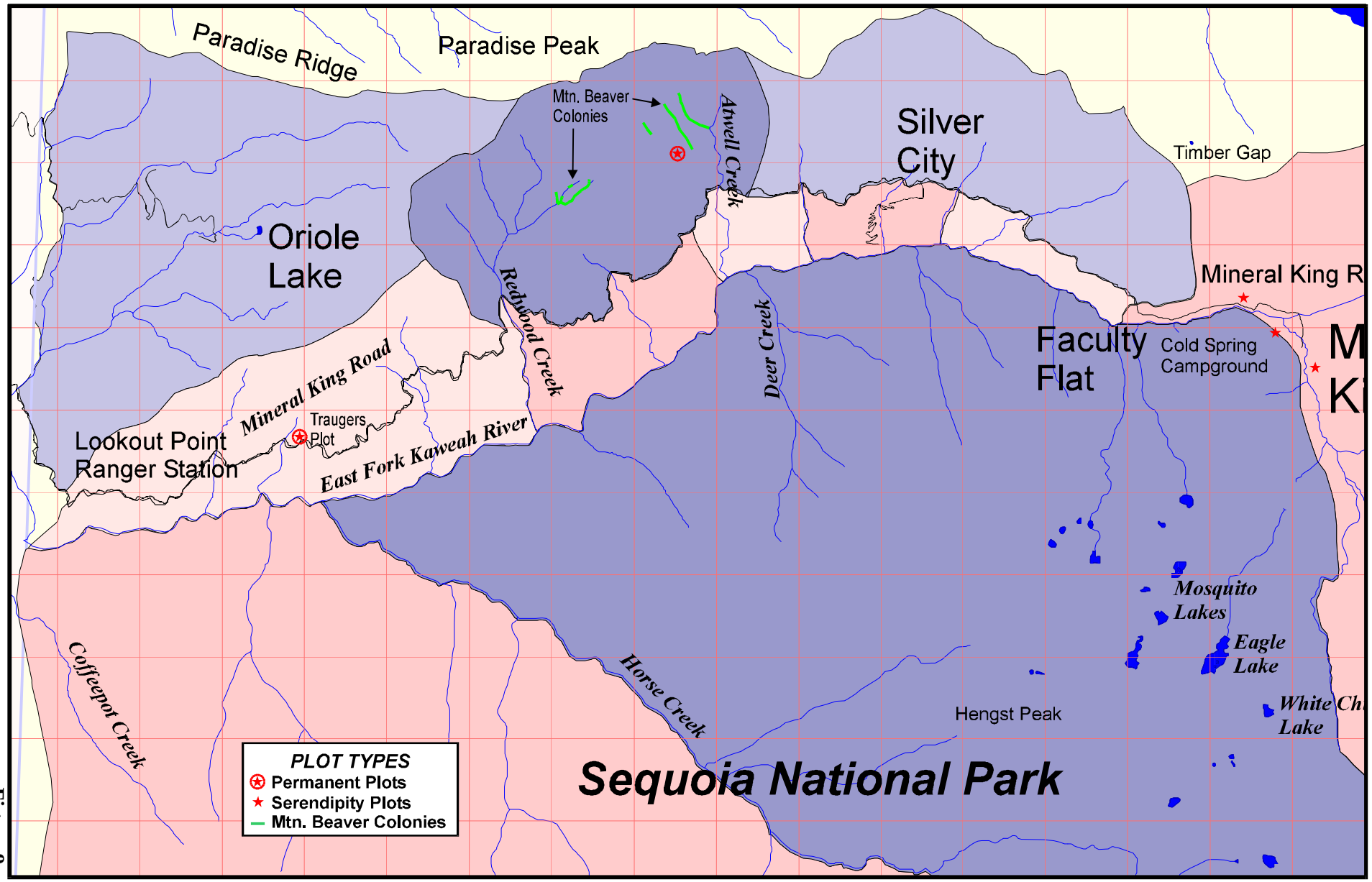

Figure 9.

Mineral King Risk Reduction Project

Wildlife Monitoring

Permanent Plots, Serendipity Plots, and Mtn. Beaver Colonies

0 1 2 3 Kilometers

0 1 2 3 Miles

N

Based on map compiled 8/95 by S. Murray

were established in the ineral ing drainage **Fig. 9** one in se uoia mi ed conifer forest twell 1 to 1 m elevation and the second in mi ed chaparral oa raugers 1 to 1 9 m elevation . lots were 5 1 5 m corrected for slope with a 15 m trapping grid for total stations per plot. Sherman live traps were located within two meters of each station. raps were baited with a mi ture of rolled oats and peanut butter. high low thermometer was located at each plot. rap lines were normally run for four nights per wee . he total number of trap nights at the two plots totaled one trap for one night . he twell plot was run from uly through ugust 1995 for a total of 1 nights. he raugers plot was trapped from September 1 through December 1 1995 for a total of nights a detailed study description is given in ppendi .

Figure 10. eighing a captured rodent in one of the small mammal trapping plots. rotective gear mas and gloves was worn by the field crew to reduce e posure to hantavirus photo by arold erner .

aptured individuals were tagged and measured for a number of standard parameters species se age weight hind foot length ear notch length tail length and general comments . During handling personnel wore respirators rubber gloves and eye protection as preventative measures against hantavirus. ased on capture recapture data population size density and home ranges were estimated.

egetation density composition and basal area of living trees and shrubs was measured at each plot. t twell tree density was dominated by ***Abies concolor*** white fir of the sampled individuals while ***Sequoiadendron giganteum*** giant se uoia dominated basal area .

hree mammal species were captured at the twell plot ***Peromyscus maniculatus*** deer mouse 91 of captures .1 captures trapnight ***Microtus longicaudis*** longtailed vole . 1 captures trapnight and ***Glaucomys sabrinus*** flying s uirrel . captures trapnight . his plot burned on about ovember 1995. Duff was completely consumed over about of the plot partially consumed over and unburned over 1 . t the raugers plot si mammal species were captured ***Neotoma fuscipes*** dus y footed woodrat 9 ***Peromyscus californicus*** alifornia mouse 1 ***Peromyscus truei*** pi on mouse 1 ***Peromyscus boylii*** brush mouse ***Microtus californicus*** alifornia vole and ***Chaetodipus californicus*** alifornia poc et mouse .

Serendipity Trapping Serendipity trapping was carried out at three sites in the ineral ing alley **Fig. 9** 1 a subalpine ***Ribes-Artemisia*** scrub site at m elevation a subalpine ***Salix*** shrub site at m elevation and in a subalpine wet meadow at 5 m elevation. Sherman live traps were placed loosely at these sites at appro imately 15 m intervals. reas were surveyed from uly 1 through ugust 5 1995 for a total of trap nights. atch per unit effort captures trapnight was used as a measure of relative abundance.

he highest trap success at the three serendipity sites was in the ***Ribes-Artemisia*** scrub where only ***P. maniculatus*** were captured . captures trapnight . he two wetland sites produced uite different

results. he ***Salix*** shrub site had low capture success with . captures trapnight for ***P. maniculatus*** and . 1 captures trapnight for ***M. longicaudus***. he wet meadow produced more species and higher overall capture success with ***Zapus princeps*** western jumping mouse dominating . captures trapnight . ther species captured at this site include ***P. maniculatus*** . capture trapnight and ***M. longicaudus*** . captures trapnight .

imited serendipity trapping was also carried out for medium sized mammals e.g. forest carnivores . his sampling was done from September 9 to December 1 1995 and amounted to 1 trap nights. rapping was conducted in white fir forest mi ed conifer hardwood forest lower montane hardwood forest trap nights in all three vegetation types and mi ed chaparral trap nights . his effort resulted in two captures of ***Martes americana*** pine marten . 9 captures trapnight in fir forest and two ***Bassariscus astutus*** ringtail cat .1 captures trapnight in riparian mi ed hardwood conifer site at edwood ree and . captures trapnight in lower montane hardwood forest .

Other Mammal Species of Special Interest

***Aplodontia* (mountain beaver)** ountain beaver in the southern Sierra evada appear to be a relict distribution. he last survey in the 19 s right 19 9 found few active colonies and they were distantly spaced the colonies in the twell rove were not located during this survey . uch of this was li ely caused by natural fragmentation of their riparian habitat.

he colony reported by right 19 9 on the east for of edwoood ree at the old riole a e rail crossing was relocated **(Fig. 9)**. nspection of the colony in 1995 showed it to be active and of considerable size e tending for several hundred meters above the trial crossing. wo additional branches of the east for of edwood ree were also found to have active mountain beaver burrows. dditional previously unreported and active ***Aplodontia*** colonies were also found in three locations in the twell ree drainage **Fig. 9** . hese colonies also e tended for several hundred meters along the cree s along which they were found. olony elevations ranged etween bout 1 5 m along waterways that appeared to be permanent and contained substantial soil development on gentle to moderately steep slopes. ll colonies were located in giant se uoia groves. hile apparent populations and number of colonies in the ineral ing area was found to be greater than originally e pected neither the short term nor long term effects of burning on the species is nown. ire history samples have been obtained from the two colony areas to provide data of past fire occurrence at these sites.

oth areas in which colonies were found burned during the burning of segment during the fall of 1995. n early anuary 199 the twell area was revisited and postburn activity around and in some of the ***Aplodontia*** burrows was noted. oth sites will be revisited during 199 to ma e general observations that might indicate fire related impacts.

Martes pennanti* (American fisher)** riginal plans for 1995 called for limited monitoring of ***Martes pennanti using trac plates. his was not done because the new protocol being developed by the orest Service for trapping this species was not yet available using this protocol is important to maintain data compatibility among nearby agencies and a large supply of trac bo es was not available.

Problems & Solutions

1 Some traps were destroyed by blac bears ***Ursus americanus*** . o alleviate this problem trapping periods need to be ept as short as possible and areas with e tensive use by blac bears need to be avoided.

antavirus protection needs to be considered early when ma ing plans for any small mammal

handling project because handling procedures add significantly to the time and cost of running monitoring operations. owever the procedures are essential because the virus is life threatening. hese procedures increase the amount of field e uipment that must be carried decreases handler comfort impedes handling generates waste that re uires sanitation and adds directly to the cost of labor and supplies. antavirus supplies need to be stoc piled to be sure of ready access because commercial and government sources are not always available. ew designs and techni ues for handling mammals are being e plored.

Dealing with late snow storms bear problems and lac of a real itchen may have added some form of charm to the field crews job but also added to the difficulty. hile the crew did not complain about conditions and were always cheery better housing facilities would have been useful. t would also have been useful if they had local access to electricity and a computer for data entry.

Plans for 1996 Field Season:

1 onduct postburn survey of the twell plot.

stablish two more long term small mammal monitoring plots. f suitable sites can be found one will be located in the hardwood conifer ecotone ***Pinus ponderosa Caloedrus decurrens Quercus kellogii*** . he other will probably be placed in a lower subalpine environment red fir efferey pine forest green leaf manzanita chaparral or sagebrush scrub . he second site may be postponed if the mi ed chaparral plot established in 1995 is burned during 199 at a date that would permit an immediate postburn survey.

ontinue serendipity surveys in habitats not surveyed with long term plots.

isit ***Aplodontia*** colonies and ma e fire related observations.

5 ontinue the development of a guide to wildlife fire environments.

Watershed Sampling

1) Watershed: Stream Chemistry and Stream Hydrology

ational iological Service S ield Station

D. . raber field crew supervisor . . ammett field crew . ohnson

Objectives ssess the effects of watershed scale prescribed fire on stream chemistry and hydrodynamics in the ineral ing watershed. Data will be compared to the reference unburned og watershed in iant orest sampled as part of another long term watershed study. his will permit some determination of how widely fire effects studies may be e trapolated to characterize fire related stream responses in the Sierra evada raber and ammett 199 . he study was designed with consultation with ohn elac im Sic man and ichael illiams of the niversity of Santa arbara S . Sediment transport was also identified as a priority study component but was not pursued due to limited e pertise and resources.

Field Work and Data Collection hree sites two streams and the ast or of the aweah were chosen for long term monitoring **Fig. 11** .

Figure 11.

Mineral King Risk Reduction Project

Watershed Studies

Stream Flow, Stream Chemistry, and Macro Invertabrates

0 1 2 3
Kilometers

0 1 2 3
Miles

Trauger's Creek Selected as a lower elevation site 1 m and located in mi ed chaparral oa woodland in a transition zone between mi ed conifer forest and chamise chaparral. recipitation for the site is measured at oo out oint miles west with a elfort ecording ain auge operated by Se uoia ational ar .

Deadwood Creek Selected as an mid to upper elevation site m and located in se uoia mi ed conifer forest. recipitation measurements for the site are recorded at the twell ill stables by a remote rain snow gauge operated by the .S. rmy orps of ngineers.

East Fork of the Kaweah River he ar outflow point on the ast or below oo out oint was chosen for obtaining grab samples. his site is the lowest point in the watershed within the ar and was selected to measure cumulative downstream effects at the main ineral ing watershed outflow point.

he stream sites were selected away from segment to permit at least one year of preburn baseline data to be collected. oth streams are perennial and partially spring fed. Streams from two elevations were chosen to span an elevational gradient representing riparian areas in mi ed conifer forest and oa woodland chaparral vegetation. Stilling wells constructed of 1 in diameter pipe enclosing two pressure transducers flow and a thermistor temperature were set up on each stream **Fig. 12** . easurements were recorded every five minutes and downloaded onto mnidata portable data loggers. his e uipment is on loan from S . ermanent stream gauges were also installed.

eginning in ay 1995 grab samples form the two stream sites and the east for were collected at regular intervals for chemical analysis. his analysis includes acid neutralizing capacity **Fig. 13** p and conductivity at the ational iological Service s Se uoia and ings anyon ield Station ater ab while major ion analysis was performed by the elac lab S for sulfate nitrate potasium phosphate clorine sodium magnesium ammonium.

Figure 12. nstalling stilling well to house a pressure transducer and thermistors to collect stream height and temperature data at the road culvert over rauger s ree .

Problems and Solutions oadwor disturbed some e uipment installed in inconspicuous locations to eep e uipment from being tampered at cree crossing.

Plans for 1996 Field Season: Sampling of the burned and unburned streams will continue at regular intervals.

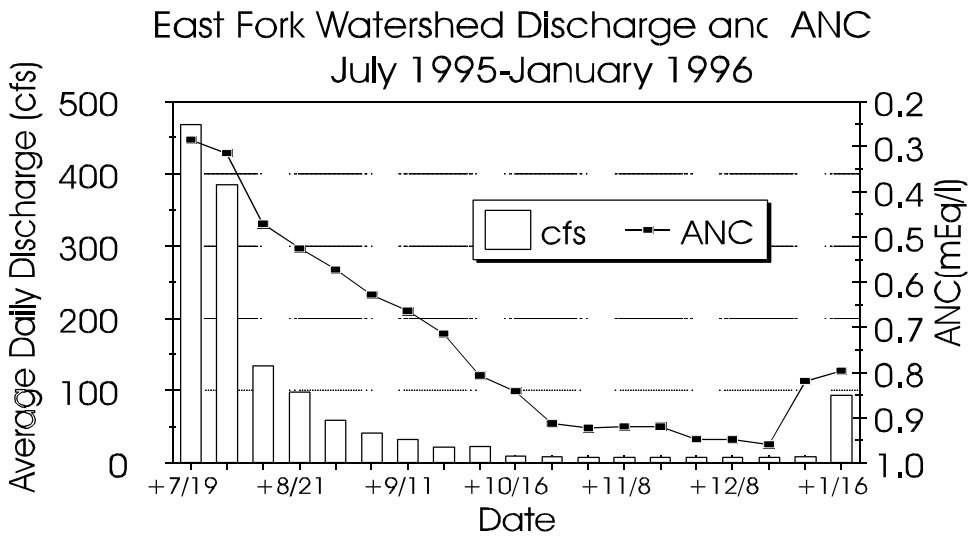

Figure 13. values their relationship to average daily discharge of the ast or of the aweah iver.

2) Watershed: Aquatic Biota Survey

niversity of alifornia Davis

. han D. rman and . rman

Objectives ssess the effects of prescribed fire on the structure of a uatic macro invertebrate communities and provide baseline inventory of composition abundance and diversity raber and ammett 199 .

Field Work and Data Collection reatment burn and non treatment reference streams were located in September 1995. n the ineral ing watershed si treatment streams were selected for sampling rauger s ree ast or Slapjac edwood ree twell ree Deadwood ree and an unnamed cree above Silver ity **Fig. 11** . hey range in elevation from 1 m to 1 m and are located in three different burn segments and . he streams were sampled for descriptive chemistry data to help characterize them. our reference streams are located in the iddle or watershed ig ern ree og ree and anther ributaries and .

reburn invertebrate sampling was carried out on all streams in September 1995. enthic macro invertebrates were collected through a combination of uantitative sampling and ualitative description in three habitat types riffles pools and slic roc glides. n addition several artificial substrates unglazed clay tiles were placed in slic roc area to help uantify colonization rates.

Plans for 1996 Field Season: rior to ne t spring 199 emergence traps will be installed to collect emerging adult species. Samples are preserved and will be identified to the lowest practical ta onomic level usually genus . ostburn surveys will trac biotic impacts and response.